METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Applicability and Principle

This method is applicable for the determination of the moisture content of stack gas.

A gas sample is extracted either at a constant rate or utilizing an isokinetic sampling train; moisture is removed from the sample stream and determined either volumetrically or gravimetrically.

Apparatus

Probe. Stainless steel or glass tubing, sufficiently heated to prevent water condensation, and is equipped with either an in-stack filter (ie. glass wool plug) or heated out of stack filter as described in EPA Method 5.

Condenser. The condenser will consist of four impingers connected in series with ground glass, leak-free fittings or any similar non-contaminating fittings. The first, third and fourth impingers will be of the Greenburg-Smith design, modified by replacing the tip with a 1.3 cm. (1/2 in.) ID glass tube extending to about 1.3 cm. from the bottom of the flask. The second impinger will be of the Greenburg-Smith design with the standard tip. The first two impingers will contain known volumes of water, the third will be empty, and the fourth will contain a known weight of 6 to 16 mesh indicating type silica gel, or equivalent desiccant.

Cooling System. An ice bath container and crushed ice, or equivalent, are used to aid in condensing moisture.

Metering System. This system will include a vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3 deg. C (5.4 deg. F) and a dry gas meter capable of measuring volume to within 2 percent.

Barometer. Mercury, aneroid or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in.).

Graduated Cylinder and/or **Balance**. These items are used to measure the condensed water in the impingers and silica gel to within 1 ml or 0.5g. Graduated cylinders will have subdivisions no greater than 2 ml. The balance will be capable of weighing to the nearest 0.5 g or less.

Procedure

A minimum total gas volume of 0.60 scm (21 scf) will be collected, at a rate no greater than 0.021 m^3/min (0.75 cfm). The moisture determination will be conducted simultaneous with, and for the same total length of time as, the pollutant emission rate run. The train will be set up as shown in Figure 4-1 of

the method. The probe and filter (if applicable) will be heated to about 120 deg. C (248 deg. F), to prevent water condensation ahead of the condenser. After the train is heated and the impingers iced down, a leak check will be performed with an acceptable rate of 4 percent the average sampling rate or 0.02 cfm, whichever is less. During the run the sampling rate will be maintained within 10 percent of constant rate. The dry gas meter volume will be recorded at the beginning and end of each sampling time increment and whenever sampling is halted. More ice will be added, if necessary, to maintain a temperature of less than 20 deg. C (68 deg. F) at the silica gel outlet. When the run is completed, a post leak check is performed, with the same acceptance criteria as for the pre-test leak check. The volume and weight of condensed moisture is measured to the nearest ml and 0.5 g, respectively.

Contaminant(s) tested and sampling time _____

Moisture train sampling time _____

In gas streams that contain water droplets, this method may produce a positive bias. If this is suspected for this source, either a wet bulb dry bulb and psychometric chart (correcting for stack pressure) or saturation and vapor pressure table determination will be conducted simultaneously with the moisture sample train, as described in the method.

The stack gas will _____ will not _____ contain moisture droplets.

Calculations

The calculations will be performed in accordance with Section 2.3 of the method.

Proposed deviations from this BTS Template or the Method